BIOCOMPATIBLE MICROPATTERNING OF o NITROBENZYL CROSSLINKED HYDROGELS BY SENSITIZED TWO-PHOTON CLEAVAGE

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Hydrogels play a major role as biomaterials for 3D-cell encapsulation. Dependent on the intended biomedical application of a hydrogel platform degradability is a crucial characteristic. By integrating photolabile junctions into the backbone or linker of a hydrated polymer network, photodegradable hydrogels can be created. Such systems, when used for cell encapsulation, allow for targeted dynamical and localized manipulation of the cell surrounding matrix by the non-invasive use of light. Photolabile *o*-nitrobenzyl (oNB) derivatives are frequently utilized linkages here, as they permit photoscission either by one-photon irradiation using UV light or by a two-photon process applying pulsed IR-laser light [1]. The later mode of excitation is of particular interest, if high resolution 3D micropatterning in presence of cells is desired. Since the two-photon absorption cross-sections δ_a of oNB functionalities are usually rather low,[2] relatively high laser powers and long irradiation times are required for photoscission. However, at such parameters encapsulated cells can be harmed.

To improve the two-photon induced process, we report a modular system permitting the sensitization of the oNB photoscission. By adding a small molecule exhibiting high two-photon absorption, we demonstrate that the efficiency of the oNB photocleavage can be effectively promoted in a concentration dependent manner and demonstrate the efficacy of this method in the presence of cells. The model hydrogel used in this study is based on hyaluronic acid (HA) and poly(ethylene glycol) (PEG) and assembled by a biocompatible Michael-type thiol-ene click reaction.

[1] C. A. DeForest, K. S. Anseth, *Nat. Chem*. 2011, 3, 925-931.
[2] I. Aujard, C. Benbrahim, M. Gouget, O. Ruel, J.-B. Baudin, P. Neveu, L. Jullien, Chem. – *Eur. J*. 2006, 12, 6865-6879